

INSECT ENEMIES OF THE HOUSE FLY, *MUSCA DOMESTICA* L.

BY S. W. BROMLEY, PH.D.

BARTLETT TREE RESEARCH LABORATORIES, STAMFORD, CONN.

INTRODUCTION

While the house fly, *Musca domestica* L., is one of the most abundant of insects and one of the most important from the standpoint of human health and sanitation, there are very few accounts in literature of the insect predators of the adult fly. The following is an annotated record of the writer's observations on this subject.

The house fly is much less numerous in New England now than was the case thirty-five years ago. Better sanitation, screens, fly sprays have all contributed, but the most important factor, completely overshadowing all others, has been the decrease of the horse as it gradually became replaced by the motorized vehicles of the gas engine era. The principal breeding medium of the house fly was horse manure. With this staple food of the house fly gone, house fly populations were bound to decrease.

The passing of old Dobbin brought about other far-reaching changes such as the decrease of the English sparrow which depended to a large extent for its winter forage, in the snow-covered northern states at least, on the undigested grain in horse droppings. As the horse population dwindled, the demand for hay dropped off with the result that farmers began to abandon their mowings initiating a succession of vegetation of weeds and brush to young woods on the old hayfield sites. This affected bird ecology to the extent that such grass-nesting birds as meadowlarks and bobolinks began to fade away from their old haunts with the passing of the grassland.

The effects on human health were evidenced by a decline of tetanus or "lockjaw" the causal organism of which thrive in soil or straw in the neighborhood of horses, as well as the decrease of typhoid fever which was carried largely by the house fly. The replacement of dirt roads by hard-surface highways for auto

transit did away with the clouds of dust which together with proximity to horses, in some cases, produced, and in others, aggravated asthma in many humans.

One entomological effect of the decrease of horses was the depletion, in New England, of the horse bot flies, *Gastrophilus* spp., which were completely dependent upon the horse for their existence. The tabanid horse flies which have a variety of hosts were affected little if to any extent. Some of the coprophagous beetles specialized in equine ejecta and have now become scarce, as for example, the beautiful *Geotrupes semiopacus* Jek.

HORNETS VS. THE HOUSE FLY

Back in the days when streets, houses, and farms reeked with house flies, I spent many hours when, as Mark Twain once remarked concerning his own observations on the habits of ants, "I should have been better employed," watching the killing of house flies by their insect enemies.

First and foremost of these insect predators was the common white-faced hornet, *Vespa maculata* L. These hornets dogged the house fly assemblages and persistently hunted down the flies. Herewith are some of these instances, a very incomplete record of my observations inasmuch as this was so commonplace an occurrence I did not take the trouble half the time to make the record.

Warren, Mass., August, 1908. Around pig sty at barn. Three captures noted.

Charlton, Mass., August 10, 1909. Around milk bucket. Two captures noted.

Dudley, Mass., August, 1910. Around barn. Two captures noted.

North Woodstock, Conn., August, 1910. Around farmhouse porch. Five captures noted.

Charlton, Mass., August, 1910. On side of barn near door of farmhouse. Four captures noted.

Southbridge, Mass., July, 1910. Around produce at a meat market. Hornets noted demonstrating their poor vision by butting into nailheads which they mistook for flies on the side of the building. Three captures noted.

Charlton, Mass., August, 1918. Around pig pen at a farm. Two captures noted.

Certain other social wasps were seen to hunt down house flies but to a less extent than *V. maculata*. These were the common native ground-nesting yellow-jacket, *Vespa maculifrons* Buy., and the English wasp, *Vespa vulgaris* L.

For *V. maculifrons* I have the following records of their capturing house flies.

Southbridge, Mass., September 28, 1913. On sunny side of stable shed. Two captures noted.

Southbridge, Mass., August 12, 1917. Around a rendering plant. Three captures noted.

On May 4, 1928, on a greenhouse window at Chappaqua, N. Y., I saw a brown wasp, *Polistes fuscatus* Fabr., capture and devour a house fly, a rather unique instance as this wasp feeds as a rule on caterpillars.

Among the solitary wasps, *Bembex spinolæ* Lep., *Oxybelus quadrinotatus* Say, *Stictia carolina* Fabr. (The "Horse Guard" of the South), and species of *Solenius* (*Crabro*) have been known to seize and store up house flies, although such observations have never chanced to come within my own personal notice.

ROBBER FLIES VS. THE HOUSE FLY

Next in importance to the hornets as house fly enemies were the robber flies. This was true of New England but throughout the Southern States the house-fly killing asilids are much more numerous than in the north, and undoubtedly surpass the hornets as enemies of *Musca*.

Around restaurant doors and windows or in the open-air markets for meat, vegetables and fruit where house flies swarmed in the old days, it was not unusual to see larger, more slender flies of another breed pouncing on *Musca domestica* individuals and sucking their blood. These were robber flies. I have several records which I have preserved for many years, and now publish a number of them, some for the first time.

Asilus notatus. Wied. A common asilid at the edge of woods, fields, and thickets, along fence rows and around buildings. It used to be attracted to house fly assemblages and was frequently

found in towns and cities, feeding on flies. Woodstock, Conn., July, 1909, on moving wagon which was swarming with flies. Southbridge, Mass., July 7, 1910, on side of meat market building. Southbridge, Mass., July 7, 1910, on box of fruit outside market. Charlton, Mass., July, 1910, on side of barn. Worcester, Mass., June 24, 1910, on restaurant window. Worcester, Mass., June 24, 1910, on sign on open-air meat counter. Boston, Mass., July, 1911, on sunny side of meat market. Boston, Mass., July, 1911, stuck with its prey on fly paper on meat counter. Boston, Mass., July, 1911, on exposed meat at open-air market.

Asilus sadyates Walker. This is a late summer counterpart of *A. notatus*. Southbridge, Mass., August, 1909, on side of building near kitchen door. Southbridge, Mass., August, 1909, on porch of house.

Asilus lecythus Walker. Larger than *A. notatus* and more local. Rockville, Pa., July 4th. Specimen in State Collection, Harrisburg, Pa.

Neoitamus (Asilus) flavofemoratus Hine. Worcester, Mass., June 24, 1910, on restaurant window.

Erax æstuanus L. The leading fly-killer of the robber fly group, east of the Rockies, is the abundant and widespread *Erax æstuanus* L. This *Erax* alights in bushes at the edges of woods or fields, on fences, buildings, domestic animals, and even on man himself where it seizes house flies, deer flies, mosquitoes and many other pestiferous Diptera.

A common name throughout the South for *Erax æstuanus* L., together with other species of the same genus is the appellation "fly-hawk," and every farmer has noted its fly-catching proclivities.

In August, 1927, Dr. C. O. Eddy, then at Clemson College, S. C., wrote me that this fly-killer had been noted throughout the summer at the insectary building where it rested on the outside walls or screens, disposing of a great number of house flies each day. Here are some records of *Erax æstuanus* feeding on *Musca domestica*. Charlton, Mass., July, 1910, on side of farm house. Charlton, Mass., August, 1911, on barn door. Southbridge, Mass., July, 1912, on screen door. Southbridge, Mass., August, 1917, on side of rendering plant. Columbia, Missouri, July 26, 1923, on

fence near farm building. Eureka, Missouri, August 4 (D. J. Knull). College Station, Texas, June 1, 1932, on side of small building; June 11, 1932, on wooden fence along pasture; July 4, 1932, on horse shed; July 8, 1932, on water tank near barn; July 14, 1932, at dairy building. Cedar Creek, Campbell County, Tennessee, June 10, 1943 (R. M. Goslin).

In sandy farm yards in the Southern States, a number of ground-resting asilids are common feeders on house flies. Outstanding are the two "fly-hawks" of the genus *Erax*: *E. barbatus* Fabr. and the so-called "Snorey-Joe," *E. interruptus* Macq., as well as the smaller *Proctacanthella* (*Asilus*) *cacopiloga* Hine; while the much smaller *Stichopogon trifasciatus* Say occasionally captures the house fly.

As distinguishing common names for the fly-hawks, I might suggest bush fly-hawk for *Erax aestuans* L.; field fly-hawk for *Erax rufibarbis* Macq., and sand fly-hawk for *Erax barbatus* Fabr.

Erax barbatus Fabr. This active little asilid feeds on house flies extensively when it can find them. Cane Springs, Imperial Valley, California, June 20, 1925, on sand near a filling station. Weslaco, Texas, June 20, 1933, on sand in citrus grove near packing shed; June 21, 1933, on truck in orange grove; July 2, 1933, on sand in citrus grove near packing shed; July 31, 1933, on sand in citrus grove near packing shed; August 14, 1933, on sand near packing shed; September 14, 1933, on sand in road through citrus grove.

Erax interruptus Macquart. While this *Erax* feeds largely on grasshoppers and Lepidoptera, it also frequently selects house flies. Yuma, Arizona, July 3, 1925, on sand in horse corral. Chadbourne, North Carolina, September 12, 1925, on path through field. Clemson College, South Carolina, August 16, 1926, on path through field; August 17, 1926, in barn yard of dairy farm. Calhoun Falls, South Carolina, August 17, 1926, in road to farm yard.

Erax rufibarbis Macquart. A common species throughout the eastern half of the United States, alighting on the ground in open fields and paths. Southbridge, Mass., September 5, 1914, in path near dump; September 10, 1915, in path near dump; September 16, 1915, on ground in dry field near stable.

Proctacanthella (Asilus) cacopiloga Hine. A common ground-resting species in sandy regions of the South. College Station, Texas, June 12, 30, 1932, in path near gate to pasture.

Proctacanthus philadelphicus Macquart. Southbridge, Mass., August, 1911, in field near stable. A unique record for this large robber fly whose capture-mechanism is designed for larger prey.

Stichopogon trifasciatus Say. South Union, Ohio, June 29, 1941 (R. M. Goslin). Scioto River, Columbus, Ohio, July 1, 1944 (R. M. Goslin).

DRAGON FLIES VS. THE HOUSE FLY

Certain dragon flies were seen to capture house flies. The late Dr. Charles Branch Wilson in his comprehensive and interesting article on "Dragon Flies in Relation to Pondfish Culture" (Bulletin of the Bureau of Fisheries, Vol. XXXVI, Document No. 882, 1920) on pages 212-214 records several species of dragon flies; *i.e.*, *Gomphus fraternus*, *G. vastus*, *Æschna constricta*, *Leucorrhinia intacta*, *Libellula luctuosa*, *Erythemis simplicicollis* and *Plathemis lydia*, feeding on house flies. My own records are rather few. The commonest dragon flies around barns and stables, *Sympetrum rubicundulum* Say and *vicinum* Hagen, I never saw make any attempt to capture the flies. My only records are of some of the large æschnid dragon flies which would occasionally put in an appearance at house fly gatherings, select a victim and depart.

Æschna constricta Say. North Woodstock, Conn., August, 1909, in farm yard. Southbridge, Mass., September, 1912, in barn yard; September 28, 1913, near stable.

Æschna clepsydra Say. Lake Mashapaug, Union, Conn., August, 1916, at kitchen door of Summer Hotel. Charlton, Mass., August, 1918, in farm yard.

Æschna umbrosa Walker. Southbridge, Mass., August 12, 1917, at rendering plant.

Æschna canadensis Walker. North Woodstock, Conn., July, 1910, near barn.

Boyera vinosa Say. Southbridge, Mass., August, 1910, in late P.M., near stable.

RECENT RECORDS

With house fly aggregations smaller during late years in the north at least, their enemies are less in evidence. It usually took

a great abundance of the flies to draw the hornets, robber flies and dragon flies, where the expenditure of effort in capturing their prey could be quickly and easily recompensed.

One may still find flies in abundance at piggeries in the dung of which the house fly will breed. The house fly does not ordinarily breed in cow manure. At pig-pens, the white-faced hornet still finds house flies in sufficient numbers to be tempting, while garbage dumps attract great numbers of *Musca domestica*.

Hoping to get the facts on present-day house fly predatism, one hot Sunday morning in August, 1943, I walked over to the town dump. Ever since its inception several years ago, this dump had been, to use a trite expression, the bane of my existence. It would catch fire every now and then and on cold winter nights, the acrid and nauseating fumes of smouldering wet paper and decomposing garbage would cascade down the river valley and collect in my back yard about a mile and a half away. I organized committees and tried to make things as miserable as possible for the good Town Fathers with my angry protests and demands for the abatement of the nuisance but to no avail. The dump went on growing and waxed mighty both in area and stench, engendering great numbers of Norway rats, European house crickets, flies and mosquitoes.

Finally compensating factors, principally ornithological, began to develop. The dump attracted flocks of crows. The crow is the most effective bird enemy of the Japanese beetle, so I didn't complain about them. The rat populations brought back the horned owl, which I had heretofore considered extinct, at least as a nesting bird, in the Stamford area. The great horned owl prefers the brown rat to all else as food: there is no better "ratter" in the whole world.

After several years had gone by, particularly as special efforts were made by the authorities to stop the fires and reduce the odors by quickly filling with soil, I began to lose my resentment. So on this particular day, I decided to brave the effluvium and see what was happening to *Musca domestica* at the hands of its insect enemies.

The flies swarming on the garbage were mostly the common carrion or garbage fly, *Phormia regina* Meigen, with a scattering

of green-bottles, *Lucilia sericata* Meigen. *Musca domestica* swarmed over the old crates and cartons. There were six or eight white-faced hornets in sight all the time, seizing all three kinds of flies.

There were ten to fifteen dragon flies, *Libellula pulchella* Drury, coursing over the garbage and over the big patches of scattered broken glass which they evidently mistook for pools of water. I watched them through the binoculars. They were feeding, not on house flies, but on some very minute insects which they picked up in the air and then chewed up while resting on some exposed point. They paid no attention to the house flies, or to the garbage flies, either.

On September 6, 1943, I revisited the dump. The white-faced hornets were again the principal fly hunters, although at this time I counted, in addition, five English wasps, *Vespa vulgaris* L., seizing house flies. At the edge of the dump a dragon fly, *Æschna umbrosa* Walker, swept in and snapped up a house fly which had just left its perch on a packing box. This was the only time I saw an Odonate catch a house fly at this dump.

The foregoing may be taken to indicate that in spite of a marked reduction of flies in New England during the past few decades, in spite of an apparent dwindling of breeding places, and in spite of the pressure of natural enemies, together with man's efforts at fly eradication, the lowly house fly is still with us and will probably be for milleniums to come.